

2006

Criticality, epistemology and behaviour vs. Design –information systems research across different sets of paradigms

B. Niehaves

ERCIS, bjni@wi.uni-muenster.de

C. Stahl Bernd

De Montfort University, bstahl@dmu.ac.uk

Follow this and additional works at: <http://aisel.aisnet.org/ecis2006>

Recommended Citation

Niehaves, B. and Bernd, C. Stahl, "Criticality, epistemology and behaviour vs. Design –information systems research across different sets of paradigms" (2006). *ECIS 2006 Proceedings*. 166.

<http://aisel.aisnet.org/ecis2006/166>

This material is brought to you by the European Conference on Information Systems (ECIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ECIS 2006 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

CRITICALITY, EPISTEMOLOGY, AND BEHAVIOUR VS. DESIGN – INFORMATION SYSTEMS RESEARCH ACROSS DIFFERENT SETS OF PARADIGMS

Niehaves, Björn, European Research Center for Information Systems (ERCIS), Leonardo-Campus
3, 48149 Muenster, Germany, bjni@wi.uni-muenster.de

Stahl, Bernd Carsten, De Montfort University, Faculty of Computer Science and Engineering,
Centre for Computing and Social Responsibility, The Gateway, Leicester LE1 9BH, UK,
bstahl@dmu.ac.uk

Abstract

Due to its dynamic and rapid development and due to a variety of academic disciplines and research communities contributing to information systems (IS) research, a broad variety of research approaches can be found. These approaches are often discussed as contrasting “paradigms”. Positivism and interpretivism are frequently accepted to be the most relevant paradigms (cf., for instance, Klein & Myers 1999; Lee 1991; Walsham 1995; Weber 2004). A further set of paradigms consists of behavioural science research (‘problem understanding paradigm’) and design science research (‘problem understanding paradigm’) which has been introduced in the IS literature and heavily adopted since (cf., for instance, Hevner et al. 2004; Jani 2001; March & Smith 1995). On top of this distinction, the critical research paradigm, including its logical complement, the non-critical paradigm, shaped the discussion of IS research philosophy for more than two decades (cf., for instance, Brooke 2002; Klein & Huynh 2004; Landry & Banville 1992; Mumford et al. 1985). Though it is essential to research theory and practice in the IS discipline to discuss the interconnections between these different sets of paradigms, such endeavour has not yet been undertaken. Some approaches address the interdependency between interpretivism and critical research. However, a holistic framework, also taking into account also behavioural and design science is still missing. Therefore, the aim of this paper is to provide an integrated discussion of these different sets of paradigms and to provide novel perspectives for IS research on how to deal with the apparent diversity of approaches. We will furthermore point out why this discussion is of great importance to IS research especially in Europe.

Keywords: Research paradigms, behavioural science research, design science research, positivism, methodological pluralism, linguistic interpretivism, epistemology, critical research

1 INTRODUCTION

IS research can be seen as a rich tapestry of diverse research methods, research paradigms, and research approaches (cf., for instance, Chen & Hirschheim 2004; Wade & Hulland 2004). Different academic disciplines and different research communities tend to develop those distinct research methods, paradigms and research approaches (Chen & Hirschheim 2004). Many disciplines, such as information systems, business administration, information science, sociology, psychology etc., contribute to studying the development, implementation, and use of information systems and information technology inside organizations (Fitzgerald & Howcroft 1998; Hevner et al. 2004; Wade & Hulland 2004). Also the contribution of many different (national) research communities to ‘international’ IS research is very rewarding. International research projects are becoming more and more important and will become standard in the future. Not only the research activities themselves, but also the publication of research results is – from the perspective of certain research communities – becoming increasingly international.

The discussion of research paradigms has influenced the discourse in the IS discipline (Burrell & Morgan 1979; Chen & Hirschheim 2004; Hirschheim & Klein 1989; Iivari 1991). Paradigms are in many cases unconscious and not explicated by the individual who is conducting research. Paradigms are questioned mainly in those situations where research approaches based on distinct paradigms are confronted – i.e. when they stem from different academic disciplines or research communities. At this point, differences regarding the implicit paradigmatic assumptions become evident and paradigmatic assumptions are analyzed. Furthermore, paradigms are often questioned when they fail to provide a sufficient explanatory power regarding new phenomena of interest (Kuhn 1962).

- In the IS discipline, we can observe a broad discussion of epistemological paradigms, especially *positivism* and *interpretivism* (Fitzgerald & Howcroft 1998; Jones 2004; Lee 1991; Mingers 2001; Probert 2001; Russo & Stoltermann 2000; Walsham 1995; Weber 2004). Here, a paradigm is understood as a distinct worldview based on certain epistemological and also ontological assumptions.
- However, the term paradigm is not only used to distinguish particular epistemological positions. Hevner et al. (2004) and March and Smith (1995) introduce two distinct paradigms: *behavioural science research* and *design science research*. The former is understood as a “problem understanding paradigm”, the latter as a “problem solving paradigm” (Hevner et al. 2004; March & Smith 1995). Thus, the term paradigm here addresses distinct phases of a problem-oriented process, understanding and solving it.
- Another pair of concepts that influences the discussion of paradigms in IS is that of *critical research* and *‘non-critical research’*. Critical research has been identified as a possible paradigm and is often portrayed as a third alternative to our first set of paradigms, positivism and interpretivism (Chua 1986; Orlikowski & Baroudi 1991). However, we will argue that they constitute a distinct set of paradigms, which should not be conflated with the interpretivism/positivism one. The central issue of critical research is that it aims to change social reality and promote emancipation.

Especially from a European perspective, the discussion of the interrelation of distinct sets of paradigms is of importance. Though the term of design science research has primarily been introduced by US literature, the IS discipline in major parts of Europe has a strong background of design-oriented research (cf., for instance, Frank 2000; Heinrich 2005), especially dominated by socio-technical design approaches (cf., for instance, Hedberg 1980; Kyng & Mathiassen 1982; Mumford & Weir 1979). Furthermore, an examination of 1893 articles published in American or European IS journals (Chen & Hirschheim 2004) revealed that, at the paradigmatic level, the vast majority (89%) of US publications are characterized by a positivist paradigm. Although European journals also mainly publish research based on positivist principles (66%), they tend to be much more receptive to interpretivist research (34%) than US journals (Chen &

Hirschheim 2004). Moreover, critical research has been strongly promoted in Europe as evidenced by the fact that the four journals, which have published or are in the process of publishing special issues on critical research (Journal of Information Technology, Information Systems Journal, Information Technology and People, International Journal of Technology and Human Interaction) are either based in Europe or have strong links to European scholarship.

Despite its high relevance to IS research and practice, a holistic framework for the integrated discussion of different sets of paradigms is still missing. Firstly, we can observe a dilution of the term paradigm¹ (see above). Secondly (and more problematic), the term has certain implicit assumptions, such as the connotation of ‘paradigmatic incommensurability’ (Kuhn 1962). Thus, in the course of this paper we are seeking to answer the following research questions:

- *What are the basic principles of the paradigms and sets of paradigms currently discussed in the IS discipline, especially design & behavioural science, positivism & interpretivism, as well as critical & non-critical research?*
- *Does ‘paradigmatic incommensurability’ hold true for all paradigms and all sets of paradigms? If not, what are their interrelations, especially between different sets of paradigms?*
- *What are the consequences of our analysis for ‘cross-paradigmatic’ research? Are there examples of cross-paradigmatic research in the literature that support our arguments? In what way is cross-paradigmatic research feasible?*

Addressing our research objective, the research method chosen is that of conceptual/philosophical research, in particular that of critique (in the Kantian understanding). This research method is dedicated to identifying, scrutinizing and questioning the presuppositions of research approaches in order to determine their scope, applicability, possibilities, and limits towards a given research objective (Kant, 1929). We will hence provide philosophical-logical arguments rather than empirical ones. However, our arguments will (where applicable) also refer to empirical research results, for instance provided by Kuhn (1962), Chen & Hirschheim (2004) and others. Furthermore, we will present additional evidence by giving empirical examples from IS research practice.

2 BEHAVIOURAL AND DESIGN SCIENCE RESEARCH

A widely used logic to systematize IS research paradigms is the differentiation between behavioural science and design science research (for instance, Davis & Olson 1985; for instance, Hevner et al. 2004; March & Smith 1995). While behavioural science research (BSR) is primarily focussed on development and justification of theories on human-computer-interaction, design science research (DSR) seeks to create IT artefacts intended to solve organizational problems. The former is called a “problem understanding paradigm”, the latter is titled as “problem solving paradigm” (see Table 1).

¹ Kuhn’s work on the structure of scientific revolutions (1962) had great impact on research on science and has strongly influenced the understanding of the term ‘paradigm’. For Kuhn (1962) a paradigm is the very element of science which provides certain application areas, successful applications, particular research methods, and a set of rules and norms for successfully conducting research in accordance with that paradigm. A scientific paradigm can be furthermore characterized as: i) What is to be observed and scrutinized, ii) the kind of questions that are supposed to be asked and probed for answers in relation to this subject, iii) how these questions are to be put, and iv) how the results of scientific investigations should be interpreted (Kuhn 1962). In fact, Kuhn himself used this term ‘paradigm’ in at least 21 ways (Masterman 1970), sometimes even inconsistently (Shapere 1966), it should nevertheless be clear that paradigms represent particular worldviews. They help the research community to conduct research within the given paradigmatic frame which can seemingly be taken for granted.

	Behavioural Science Research (BSR)	Design Science Research (DSR)
origin	natural science	engineering, sciences of the artificial
paradigm	problem understanding paradigm	problem solving paradigm
objective	to develop and justify theories which explain or predict organizational human phenomena surrounding the analysis, design, implementation, management, and use of information systems	to create innovations that define ideas, practices, technical capabilities, and product through the analysis, design, implementation, management, and use of information systems
object	Human-Computer-Interaction	IT artefact design

Table 1: Behavioural vs. Design Science Research (cf. Hevner et al. 2004; March & Smith 1995)

Behavioural science research and design science research are seen as two complementary parts of the IS research cycle (Hevner et al. 2004; March & Smith 1995). Acquiring knowledge about information systems employed in an organizational context requires the application of both research paradigms: Starting from pre-scientific observation of IS and information technology (IT) usage in practice, theories about IS-related issues are developed. These theories are supposed to primarily explain and predict human behaviour, information system function, and issues interrelated with both of these aspects. By the process of justification, these theories are considered to be true or valid. Thus, they provide a basic understanding of the (real world) problem situation described in the first instance. This understanding presents the basis for the design of one or more IT artefacts which address a given problem situation. By actually applying them, IT artefacts are supposed to become useful in terms of problem solving. Thus, they change present IS usage in practice and, for that reason, provide new impulse for theory development. March & Smith (1995) provide several reasons why such a ‘cross-paradigmatic collaboration’ is essential:

- “Design science provides substantive tests of the claims of natural science research.” (March & Smith 1995, p. 254)
- “How [...] are we to determine if theoretical claims are true? This validation problem is overcome in part by the effectiveness of theories in practical applications.” (March & Smith 1995, p. 254)
- „Well-informed actions (i.e., those based on true beliefs) are more likely to achieve desired ends. Information is valuable insofar as it helps individuals form true beliefs which, in turn, promote effective, goal achieving action” (March & Smith 1995, p. 251)
- “Design Science creates artifacts, giving rise to phenomena that can be the targets of natural science research” (March & Smith 1995, p. 254)

As a consequence, information systems research is a process which includes both behavioural science as well as design science research. Regarding the interrelationship analysis of the two elements of this set of paradigms, these two ‘paradigms’ behavioural and design science research are not only commensurable; they are calling for each other. Thus, the label ‘paradigm’ with regard to the connotation of ‘paradigmatic incommensurability’ (Kuhn 1962) is not fully applicable. As the discussion of behavioural and design science research addresses the question of different phases of the research process, it still remains to be answered how this interrelates to the discussion of positivism & interpretivism (Section 3) or critical & non-critical research (Section 4).

3 POSITIVISM AND INTERPRETIVISM

In recent IS literature an extensive discussion of epistemological research paradigms, such as positivism and interpretivism, and their assumptions can be found (cf., for instance, Burrell & Morgan 1979; Chen & Hirschheim 2004; Fitzgerald & Howcroft 1998; Hirschheim & Klein 1989; Iivari et al. 1998; Lee 1991; Monod 2003; Weber 2004). Epistemological assumptions were considered alongside ontological and methodological ones, those mainly taken into account in order to identify and to describe distinct

paradigms as well as to differentiate them from each other (see Figure 1). Especially positivism and interpretivism have been intensively discussed against the background of (their) epistemological assumptions.

Author	Criteria	IS research paradigms
G. Burrell & G. Morgan (1979)	a. Ontology, b. Epistemology, and c. Methodology	Functionalism, interpretivism, radical humanism, and radical structuralism
J. Iivari (1991)	a. Ontology, b. Epistemology, and c. Methodology	Functionalism, interpretivism, radical humanism, and radical structuralism
B. Fitzgerald & D. Howcroft (1998)	a. Ontology, b. Epistemology, and c. Truth	Positivism, interpretivism
E. Monod (2003)	a. Epistemology I: Object of knowledge, b. Epistemology II: Origin of knowledge	Multiple IS research paradigms and philosophical trends, e. g. functionalism, constructivism, critical realism
R. Weber (2004)	Multiple. Amongst others ontology, epistemology, research object, method, theory of truth etc.	Positivism, interpretivism

Figure 1: Analyzing Epistemological Assumptions of Distinct IS Research Paradigms

In IS research literature, two basic divergent streams of thought can be found regarding the definition of positivism and interpretivism. These standpoints provide contrasting answers to the question of how these two elements of this set of paradigms interrelate to each other:

- A) Core argument of the first alternative viewpoint: Positivism and interpretivism feature distinct epistemological assumptions, but share the (ontological) ‘real world’ assumption (see Becker & Niehaves 2006). The main objective of IS research, learning how IS as socio-technical systems work, is common to interpretivism and positivism. The research questions being formulated in positivism or interpretivism do not necessarily have to be, but can very well be the same (Mingers 2001). Here, for instance, Weber (2004) argues that both positivism and interpretivism share the assumption that a real world exists beyond the realms of human cognition. However, positivism assumes that there exists in principle the possibility that objective knowledge about this real world can be achieved, while interpretivism emphasizes that knowledge is always determined by the subject and, thus, no such thing as objective knowledge exists (see Figure 2 and cf., for instance, Weber 2004). As a consequence of this perspective, interpretivism and positivism do not lead to different paradigmatic views on IS, but they do analyze IS differently. They do not inevitably lead to contradictory theories of IS and are, thus, not incommensurable in the sense of Kuhn. Such an interpretation would explain the possibility of successfully combining positivist and interpretivist approaches (cf. Trauth & Jessup 2000).
- B) Core argument of the second alternative viewpoint: positivism and interpretivism neither share the epistemological nor the ontological assumption. The first point of view suggested that positivism and interpretivism agree on the existence of a real world (see above). A different ontological interpretation would be that positivism is based on the doctrine of ontological realism, which holds that reality is *independent* of the observer, whereas interpretivism relies on the hermeneutic and phenomenological tradition, where such observer-independence of reality is not usually accepted (Moran 2000; Varey et al. 2002). Ontologically interpretivism thus seems to be close to positions that we usually call “constructivism” or “constructionism” (cf. Gergen 1999). If we assume that the fundamental difference between positivism and interpretivism is the ontological question of reality (or our knowledge thereof (cf. Darke et al. 1998; Klein & Myers 1999; Miranda & Saunders 2003)), then it is arguably difficult to reconcile the two paradigms. Depending on whether reality is a (social) construction or not, the epistemology and methodology will differ vastly. Moreover, even

where research results are broadly similar in format and appearance, their meaning will be radically different. Where positivism aims to create true statements by describing the world objectively as it is, interpretivism is engaged in sense-making on an organisational and individual level. The criteria of truth and thus of good research are fundamentally different. This extends to the role of the researcher, who, in positivism, is an external observer, whereas in interpretivism needs to be involved in the situation (Introna 1997; Trauth 2001). As a consequence, interpretivism would here be seen as more strongly differing from positivism (see again Figure 2).

Thus, the debate on the commensurability of positivism and interpretivism can be seen as an open issue. None of the arguments provided by the two alternative viewpoints can be seen as finally binding. One might argue that the fundamentally different understandings of 'interpretivism' would suggest finding distinct terms for each concept. However, both concepts appear under the same label in the IS literature and one must therefore be aware of the alternative definitions. Nevertheless, both definitions of interpretivism and the definition of positivism make a clear point that this set of paradigms addresses the different (epistemological and ontological) assumptions and worldviews which can be made.

		Epistemological position (regarding the relationship of cognition and the object of cognition)	
		Objective cognition is impossible (constructivism)	Objective cognition is possible (epistemological realism)
Ontological position	A real world is existent (ontological realism)	Interpretivism (according to Standpoint A)	Positivism
	No 'real world' exists (ontological idealism)	Interpretivism (according to Standpoint B)	

Figure 2: *Epistemological Differences between Positivism and Interpretivism*

4 CRITICAL AND NON-CRITICAL RESEARCH

The concept of criticality opens up another dimension to the paradigm discussion in the IS discipline. Critical research is often seen as the 'third paradigm', an alternative to interpretivism and positivism. We contend that critical research is significantly different from positivism and interpretivism. We will argue that the critical paradigm is not an exclusive alternative to interpretivism or positivism: Criticality is a different perspective on the analysis that can add up to critical-positivist or critical-interpretivist research. Whereas non-criticality, we will argue, is the logical complement to criticality which means that the particular research(er) does not take a critical perspective.

The fundamental issue of critical research is that it aims to change the status quo because it finds social realities unjust; the purpose of critical research is to promote emancipation (McGrath 2005; Cecez-Kecmanovic 2001; McAulay et al. 2002). Despite the problem of finding a clear definition of critical research (Brooke 2002), there are some characteristics of critical research that render it sufficiently easy to identify and that allow us to describe it in terms of a paradigm:

- *Most importantly, critical research seeks to change reality.* This characteristic can be used to distinguish the critical and the non-critical paradigm where non-critical research is concerned with the description of reality and critical research with change. The reason why critical researchers aim to be normative and create change is that they believe that the way our societies are constituted includes a large number of injustices. Critical research has developed from Marxist theory (Hirschheim & Klein 1989; Nord & Jermier 1992) and shares the deep Marxist suspicion of capitalism. The critical intention leads to a different outlook on life in general and on research in particular. As Walsham (2005, p. 112) puts it, "a critical stance is focused on what is wrong with the world rather than what is right."

- *The critical intention to change reality is usually expressed in terms of emancipation.* Emancipation is the self-professed goal of research in the critical paradigm. It aims to "to free human subjects from oppressive regimes within societies and within the institutions that constitute them" (McGrath 2005, p. 88). In order to achieve emancipation, it is necessary to overcome repressive ideological and social conditions that preclude humans to develop to their potential (Alvesson & Willmott 1992; Klein & Huynh 2004; Ngwenyama & Lee 1997). The critical intention and the wish to promote and further emancipation have led critical researchers in IS to concentrate on some groups of topics (for instance, the issue of power (Mingers 1992), gender in IS (Kvwasny et al. 2005), digital divide (Kvasny & Trauth, 2003), or IS failure (Wilson & Howcraft 2002)), theories (especially the Frankfurt School influenced by, for instance, Karl-Otto Apel (1979) or Jürgen Habermas, but also French theorists combining Marxist, phenomenological, and existential streams, such as Pierre Bourdieu or Michel Foucault) and methodologies.
- *Critical research questions the assumption of rationality.* A topic area of high importance to critical research is that of rationality. The capitalist constitution of society is closely linked to a certain type of rationality, sometimes called purposive or strategic rationality, which, in turn, can be a cause of a lack of attention to issues of emancipation. Research in the critical paradigm is thus often concerned with the way we understand and apply the concept of rationality (Cecez-Kecmanovic et al. 2002; Varey et al. 2002).

To summarize, the critical paradigm can be characterized by the critical intention to change reality and the wish to emancipate alienated individuals. It tends to concentrate on topics where alienation is most visible and it is based on a set of theories, which reflect the critical intention. The non-critical paradigm, on the other hand, is purely descriptive and has no specific regard for emancipation.

5 INTERDEPENDENCIES & PARADIGM COMMENSURABILITIES

The discussion in the IS literature often focuses on the discussion of (in)commensurability within the sets of paradigms described, while the analysis of the interrelation between the sets of paradigms is often omitted. The main interest of a discussion of paradigms in IS research refers to the question of paradigm incommensurability: The question is whether the use of one paradigm precludes the simultaneous use of another. This question is of high theoretical interest, but it is also relevant because the answer will determine possible types of research and collaboration. In order to see whether and which of the paradigms (or pairs of paradigms) are incommensurable, we will first review the relationship between the members of the three pairs of paradigms discussed here and then draw conclusions regarding the relationships between the different types of paradigms. Regarding the three sets of paradigms, the relation of the elements within them can be described as following:

1. Behaviour Science Research & Design Science Research: IS research is a process which comprises both behavioural science as well as design science research. In this case, the two 'paradigms' are not only commensurable; they are calling for each other (Hevner et al. 2004). Thus, 'paradigmatic incommensurability' (Kuhn 1962) is not the case regarding behavioural and design science research.
2. Positivism & Interpretivism: The debate between adherents of the positivist and interpretivist paradigms has dominated the discussion on the basics and philosophy of the IS discipline and different views on the commensurability of the two paradigms are advocated. We have argued above that they can be seen as different but compatible views of the same research subject, but they can also be seen as intrinsically contradictory. Both sides have been supported with a variety of different arguments (cf. Landry & Banville 1992) so that the question of 'paradigm incommensurability' regarding positivism and interpretivism has to be seen as an open issue.

3. Critical Research & Non-Critical Research: This final pair of paradigm differs from the first two through the fact that it was explicitly designed in a dichotomous way. Following the traditional Aristotelian logic that says that something cannot be A and non-A at the same time (proposition of the excluded third), we can state that critical and non-critical research are not commensurable. That means that one cannot do a piece of research that is simultaneously critical and non-critical.

Regarding the relationship of elements within these three sets of paradigms, we can state that the range comprises explicit commensurability (behavioural and design science research), logical incommensurability (critical and non-critical research), and an open commensurability discussion of positivism and interpretivism (see Table 2).

	Behavioural Science Research	Design Science Research	Positivism	Interpretivism	Critical Research	Non-Critical Research
Core Question	(1) What is the stage/phase of the research process?		(2) What is the (epistemological and ontological) worldview?		(3) What is the purpose of research?	
(In)Commensurability	Imperative to combine Behavioural and Design Science Research		Discussion on (in)commensurability is still open.		Critical and non-critical research logically exclude each other	
Core Answer	Problem understanding phase	Problem solving phase	Objective Knowledge can be achieved in principle	Knowledge is always subjective	Change of reality; emancipation	Description of reality
Assumption regarding the stage of research	Problem Understanding	Problem Solving	Open	Open	Open	Open
Epistemological Assumption	Open	Open	Epistemological Realism	Epistemological Constructivism	Open (although traditionally close to interpretivism)	Open
Assumption regarding problems in society	Open	Open	Open	Open	Society is conflictual (history is history of class struggle)	Usually not explicitly reflected; naïve assumption of harmony

Table 2: Core Qualities of Distinct Paradigms and Paradigm Sets

Different sets of paradigms answer different core questions and, thus, provide different perspective on IS research. These perspectives are not exclusive but complementary. We will now discuss their interrelation among the sets of paradigms:

1. Behaviour Science Research & Design Science Research: The discussion of behavioural and design science research focuses on the different phases of the research process (Mingers 2001; Tashakkori & Teddlie 1998) while design science addresses the phase of undertaking action to change the situation analysed by behavioural science efforts (Hevner et al. 2004). Although it is often argued that only behavioural science could be viewed from either a positivist or an interpretivist standpoint (Hevner et al. 2004, p. 98), we argue that also design science (seen as just the later phase of research) embraces a certain epistemological perspective. Here, for instance Boland (1989) takes an interpretive perspective on design science research, whereas Hevner et al. (2004) take an implicit positivist stance, for instance, using terms as ‘reality’ or ‘truth’ in a positivist manner (Hevner et al. 2004, pp. 76-81) and providing evaluation guidelines that follow a positivist logic (Hevner et al. 2004, pp. 82-90). While there seem to be few examples of openly critical design research, one can argue that the interventionist aim of design research lends itself to critical interpretation. A classical example of this is the socio-technical tradition whose aim is to use participative methods to design systems in an emancipatory way (Mumford, 2003).
2. Positivism & Interpretivism: The discussion of positivism and interpretivism addresses the different (ontological and epistemological) worldviews. As shown above, this discussion provides an orthogonal perspective on behavioural and design science research. Furthermore, particular research efforts have shown that both positivism and interpretivism can also be accessed by critical as well as non-critical research (see again Table 3). For instance, Westland (2004) advocates a positivist and non-critical

standpoint for IS research, while Schultze & Leidner (2002) as well as Miranda & Saunders (2003) argue in favour of an interpretivist and non-critical standpoint. On the other hand, Pozzebon (2004) provides a critical view on interpretivism, while the orthodox Marxist research as undertaken in the former Warsaw Pact countries functions as an example of a critical but positivist view (see Table 3).

3. **Critical Research & Non-Critical Research:** In terms of ontology and epistemology, critical research in IS (CRIS) is usually, but arguably not necessarily, close to interpretive research. Still, it seems that critical researchers tend to find a social constructionist ontology more convincing than the ontological realism prevalent in positivism. They are interested in questions of alienation and ideology, which tend to be interpreted in linguistic terms. The reality that critical research aims to change is not the natural world but rather the social interpretation of reality. Critical research is therefore interested in epistemologies and methodologies that stress the relevance of social construction and thus of language. However, McGrath (2005) points out that there is no agreed-upon methodology of critical research. Furthermore, a difficult, and arguably unresolved, problem of CRIS is the status of empirical research. The mainstream of IS research relies heavily on empirical investigation. While CRIS also claims empirical relevance, indeed, it is hard to see how you can change social reality without empirical intervention, critical researchers are much more sceptical about empirical findings. If reality is structured by interpretive schemas and if it is pervaded by a range of ideologies, then empirical research findings cannot be taken at face value. Theoretical research is then arguably at least as important as empirical investigations. As a consequence, the question of criticality is open to theoretical research (behavioural science orientation) as well as interventional action (design science orientation). The logic of intertwined theory and action holds thus true for critical and non-critical research (for examples, see Table 3).

	Behavioural Science Research	Design Science Research	
Positivist Research	e.g., Westland(2004)	e.g., Hevner et al.(2004)	Non-Critical Research
	e.g., Orthodox Marxist Research		Critical Research
Interpretivist Research	e.g., Pozzebon (2004)	e.g., Mumford (2003)	Critical Research
	e.g., Schultze & Leidner(2002), Miranda & Saunders (2003)	e.g., Boland (1989)	Non-Critical Research

Table 3: Research Examples across different Sets of Paradigms

Hence, the three different sets of paradigms that shaped the discussion within the IS discipline have often been examined independently from each other. As shown in our above analysis, each set addresses different core question. This means that, although certain paradigms are possibly exclusive alternatives within their set (for instance, positivism and interpretivism or critical and non-critical research), they are not exclusive regarding other sets of paradigms. As a consequence, the sets of paradigms provide different perspectives on IS research and find themselves in an orthogonal and logically independent relation to each other. For instance, answering the epistemological question and taking an interpretive stance does not mean that this includes a position taken regarding the question of the research phase (behavioural science vs. design science) or the question of criticality. Which of these dimensions is relevant to be answered is an open question to the particular research setting. However, we advocate that an awareness of all three

dimensions is essential to an effective research communication in a multi-disciplinary and international research environment, such as on information systems!

6 CONCLUSIONS AND FUTURE RESEARCH PERSPECTIVES

This paper does not end with a simple formulaic conclusion. There is no easy answer or trivial relationship that would allow providing IS researchers with guidelines on which paradigm can or should be used with which other paradigms. All research is based on a number of (often implicit) fundamental assumptions, the totality of which has been called a paradigm. The concept of a "paradigm" thus does not take away the researcher's responsibility to reflect on the basis of the research. Due to the multitude of established paradigms, an IS researcher must actively reflect on the components of the paradigm he or she wants to work in. In doing so, the researcher must consider the difficult question of commensurability. He or she must ask questions such as: is my methodology compatible with my epistemology and my ontology? Is my assumption about the nature of society and the nature of human relations compatible with my choice of research question? Does the aim of my research require me to undertake investigation into design? These and many related questions need to be answered in order to ensure that the research is internally consistent and approachable and valuable for external readers. The major difficulty of this conclusion is that it requires researchers to undertake reflections of a nature that they are often neither interested nor skilled in.

This paper allows a different perspective on the question of paradigm. We developed complexities by identifying three different sets of paradigms in order to show that some of the typical assumptions regarding paradigms are simply wrong. There are certainly more possible research paradigms, which deserve being analysed, but which we could not address in this work. However, the paradigm selection made was based on the relevance of the particular paradigm in the current IS discussion. Particularly in the positivism vs. interpretivism debate in IS, there seems to be the assumption that the two paradigms are mutually exclusive and complete. That means that one must choose either one or the other and that, once chosen, one has to adhere to the paradigm. Adding two more pairs of paradigms to this equation renders it obvious that these alternatives are false. Within the current discussion in IS on paradigms, different streams of thought coin paradigmatic views, they answer different core questions and have distinct viewpoints on the issue. The three pairs of paradigms we have discussed are in many cases orthogonal to one another. For instance, one can be a critical interpretivist or a critical positivist. It is, for instance, also possible to concentrate on design from an interpretivist or a positivist position.

What this paper hopes to do is raise the awareness that there is NO fundamental philosophical reason why IS research needs to be confined to these two paradigms. There is a variety of further paradigms and perspectives. The challenge for us is to identify and describe them in detail. In the long run this might lead to a sort of repository of acceptable paradigms. A researcher wanting to use one of these could refer to the fact that it has been established as valid. This does not mean that we are looking for centralized control of which approaches researchers can take. A researcher wishing to develop a new approach could certainly do so but she or he would have to go through the complex process of making sure that the approach (or paradigm) is tenable, consistent and non-contradictory. For those who do not wish to expend the intellectual exertion of doing this, the set of established paradigms would offer the advantage of reducing the complexity of research and allowing them to engage in normal science, which, according to Kuhn, is what most of us do most of the time anyway.

REFERENCES

- Alvesson, M., and Willmott, H. "On the Idea of Emancipation in Management and Organization Studies," *Academy of Management Review* (17:3) 1992, pp 432 - 464.
- Apel, K.-O. *Towards a Transformation of Philosophy* Routledge Kegan & Paul, London, 1979.
- Becker, J., and Niehaves, B. "An Epistemological Framework for Analyzing IS Research Approaches," *Information Systems Journal* (16) 2006 [to appear].

- Boland, R. "The Experience of System Design: A Hermeneutic of Organizational Action," *Scandinavian Journal of Management* (5:2) 1989, pp 87-104.
- Brooke, C. "Critical Perspectives on Information Systems: An Impression of the Research Landscape," *Journal of Information Technology* (17:3) 2002, pp 271 - 283.
- Burrell, G., and Morgan, G. *Sociological Paradigms and Organizational Analysis*, London, UK, 1979.
- Cecez-Kecmanovic, D. "Doing Critical IS Research: The Question of Methodology," in: *Qualitative Research in IS: Issues and Trends*, E. Trauth (ed.), Idea Group Publishing, Hershey, 2001, pp. 141-162.
- Cecez-Kecmanovic, D., Janson, M., and Brown, A. "The Rationality Framework for a Critical Study of Information Systems," *Journal of Information Technology* (17:2) 2002, pp 215-227.
- Chen, W., and Hirschheim, R. "A paradigmatic and methodological examination of information systems research from 1991 to 2001," *Information Systems Journal* (14:3) 2004, pp 197-235.
- Chua, W.F. "Radical developments in accounting thought," *Accounting Review* (61:4) 1986, pp 601-632.
- Darke, P., Shanks, G., and Broadbent, M. "Successfully completing case study research: combining rigour, relevance and pragmatism," *Information Systems Journal* (8:3) 1998, pp 273-289.
- Davis, G.B., and Olson, M.H. *Management Information Systems: Conceptual Foundations, Structure and Development*, (2nd ed.) McGraw-Hill, New York, 1985.
- Fitzgerald, B., and Howcroft, D. "Competing Dichotomies in IS Research and Possible Strategies for Resolution," 19th International Conference on Information Systems ICIS 1998, Helsinki, Finland, 1998, pp. 155-164.
- Frank, U. "Evaluation von Artefakten in der Wirtschaftsinformatik," in: *Evaluation und Evaluationsforschung in der Wirtschaftsinformatik*, L.J. Heinrich and I. Häntschel (eds.), Oldenbourg, München, Wien, 2000, pp. 35-48.
- Gergen, K. *An Invitation to Social Construction* Sage, London et al., 1999.
- Hedberg, B. "Using computerized Information Systems to design better Organizations and Jobs," in: *The Human Side of Information Processing*, N. Bjoern-Andersen (ed.), North-Holland, Amsterdam, the Netherlands, 1980.
- Heinrich, L.J. "Forschungsmethodik einer Integrationsdisziplin: Ein Beitrag zur Geschichte der Wirtschaftsinformatik," *NTM International Journal of History and Ethics of Natural Sciences, Technology and Medicine* (13:2) 2005, pp 104-117.
- Hevner, A.R., March, T.S., Park, J., and Sudha, R. "Design Science in Information Systems Research," *MIS Quarterly* (28:1) 2004, pp 75-105.
- Hirschheim, R., and Klein, H.K. "Four Paradigms of Information Systems Development," *Communications of the ACM* (32) 1989, pp 1199-1216.
- Iivari, J. "A paradigmatic analysis of contemporary schools of IS development," *European Journal of Information Systems* (1/1991/4) 1991, pp 249-272.
- Iivari, J., Hirschheim, R., and Klein, H. "A paradigmatic analysis contrasting information systems development approaches and methodologies," *Information Systems Research* (9:2) 1998, pp 164-193.
- Introna, L. *Management, Information and Power: A narrative of the involved manager* MacMillan, London, 1997.
- Jani, A.Y. "IS Research Relevance: A Perspective from Design Science and the Philosophy of Technology," 7th Americas Conference on Information Systems AMCIS 2001, Boston/MA, U.S.A., 2001, pp. 2006-2010.
- Jones, M.R. "Debatable Advice and Inconsistent Evidence: Methodology in Information Systems Research," in: *Information Systems Research: Relevant Theory and Informed Practice*, B. Kaplan, D. Truex III, D. Wastell, A.T. Wood-Harper and J.I. DeGross (eds.), Kluwer Academic Publishers, Boston, 2004.
- Klein, H.K., and Huynh, M.Q. "The Critical Social Theory of Jürgen Habermas and its Implications for IS Research," in: *Social Theory and Philosophy for Information Systems*, J. Mingers and L. Willcocks (eds.), Wiley, Chichester, 2004, pp. 157 - 237.
- Klein, H.K., and Myers, M.D. "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems," *MIS Quarterly* (23:1) 1999, pp 67-94.
- Kuhn, T.S. *The Structure of Scientific Revolutions* Chicago University Press, Chicago/IL, U.S.A., 1962.
- Kvwasny, L., Greenhill, A., and Trauth, E. "Giving Voice to Feminist Projects in MIS Research," *International Journal of Technology and Human Interaction* (1:1) 2005, pp 1 - 18.
- Kyng, M., and Mathiassen, L. "Systems development and trade union activities," in: *Information Society, for Richer, for Poorer*, N. Bjoern-Andersen (ed.), North-Holland, Amsterdam, the Netherlands, 1982.
- Landry, M., and Banville, C. "A Disciplined Methodological Pluralism for MIS Research," *Accounting, Management & Information Technology* (2:2) 1992, pp 77 - 92.
- Lee, A. "Integrating positivist and interpretivist approaches to organizational research," *Organization Science* (2) 1991, pp 342-365.
- March, T.S., and Smith, G. "Design and Natural Science Research on Information Technology," *Decision Support Systems* (15:4) 1995, pp 251-266.

- Masterman, M. "The Nature of Paradigms," in: *Criticism and the Growth of Knowledge*, I. Lakatos and I. Musgrave (eds.), Cambridge University Press, Cambridge/MA, U.S.A., 1970, pp. 59-90.
- McAulay, L., Doherty, N., and Keval, N. "The Stakeholder Dimension in Information Systems Evaluation," *Journal of Information Technology* (17) 2002, pp 241 - 255.
- McGrath, K. "Doing critical research in information systems: a case of theory and practice not informing each other," *Information Systems Journal* (15:2) 2005, pp 85-101.
- Mingers, J. "Technical, Practical and Critical OR - Past, Present and Future?," in: *Critical Management Studies*, M. Alvesson and H. Willmott (eds.), Sage, London, 1992, pp. 90 - 113.
- Mingers, J. "Combining IS research methods: towards a pluralist methodology," *Information Systems Research* (12:3) 2001, pp 240-259.
- Miranda, S.M., and Saunders, C.S. "The Social Construction of Meaning: An Alternative Perspective on Information Sharing," *Information Systems Research* (14:1) 2003, pp 87 - 106.
- Monod, E. "A Copernican Revolution in IS: Using Kant's Critique of Pure Reason for Describing Epistemological Trends in IS," 9th Americas Conference on Information Systems AMCIS 2003, Tampa/FL, U.S.A., 2003, pp. 2719-2724.
- Moran, D. *Introduction to Phenomenology* Routledge, London, New York, 2000.
- Mumford, E. *Redesigning Human Systems*. Hershey, PA: Information Science Publishing, 2003.
- Mumford, E., Hirschheim, R., Fitzgerald, G., and Wood-Harper, T. (eds.) *Research Methods in Information Systems - IFIP 8.2 Proceedings*. North-Holland, Amsterdam, 1985.
- Mumford, E., and Weir, M. *Computer Systems in Work Design - The ETHICS Method* Associated Business Press, London, UK, 1979.
- Ngwenyama, O.K., and Lee, A.S. "Communication Richness in Electronic Mail: Critical Social Theory and the Contextuality of Meaning," *MIS Quarterly* (21:2) 1997, pp 145 - 167.
- Nord, W.R., and Jermier, J.M. "Critical Social Science for Managers? Promising and Perverse Possibilities," in: *Critical Management Studies*, M. Alvesson and H. Willmott (eds.), Sage, London, 1992, pp. 202 - 222.
- Orlikowski, W.J., and Baroudi, J. "Studying information technology in organizations: research approaches and assumptions," *Information Systems Research* (2:1) 1991, pp 1-28.
- Pozzebon, M. "Conducting and Evaluating Critical Interpretive Research: Examining Criteria as a Key Component in Building a Research Tradition," in: *Information Systems Research: Relevant Theory and Informed Practice. IFIP 8.2 Proceedings*, B. Kaplan, D.P. Truex, D. Wastell, A.T. Wood-Harper and J. DeGross (eds.), Kluwer Dordrecht, 2004, pp. 275 - 292.
- Probert, S.K. "Contemporary Epistemology and IS Methodology: An Interpretive Framework," 7th Americas Conference on Information Systems AMCIS 2001, Boston/MA, U.S.A., 2001.
- Russo, N.L., and Stoltermann, E. "Exploring the assumptions underlying information systems methodologies. Their impact on past, present and future ISM research," *Information Technology & People* (13:4) 2000, pp 313-327.
- Schultze, U., and Leidner, D. "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions," *MIS Quarterly* (26:3) 2002, pp 213 - 242.
- Shapere, D. *Mind and Cosmos. Essays in Contemporary Science and Philosophy*, Pittsburgh/PA, U.S.A., 1966.
- Tashakkori, A., and Teddlie, C. *Mixed Methodology: Combining qualitative and quantitative approaches* Sage Publications, London, U.K., 1998.
- Trauth, E. "Choosing Qualitative Methods in IS Research: Lessons Learned," in: *Qualitative Research in IS: Issues and Trends*, E. Trauth (ed.), Idea Group Publishing, Hershey, 2001, pp. 271 - 287.
- Trauth, E., and Jessup, L.M. "Understanding Computer-Mediated Discussions: Positivist and Interpretive Analyses of Group Support System Use," *MIS Quarterly* (24:1) 2000, pp 43-79.
- Varey, R.J., Wood-Harper, T., and Wood, B. "A Theoretical Review of Management and Information Systems Using a Critical Communications Theory," *Journal of Information Technology* (17:1) 2002, pp 229 - 239.
- Wade, M., and Hulland, J. "Review: The Resource-Based View and Information System Research: Review, Extension, and Suggestions for Future Research," *MIS Quarterly* (28:1) 2004, pp 107-142.
- Walsham, G. "Interpretive Case Studies in IS Research: Nature and Method," *European Journal of Information Systems* (4) 1995, pp 74-81.
- Walsham, G. "Learning about Being Critical," *Information Systems Journal* (15:2) 2005, pp 111 - 117.
- Weber, R. "The Rhetoric of Positivism Versus Interpretivism," *MIS Quarterly* (28:1) 2004, pp iii-xii.
- Westland, J.C. "The IS Core XII: Authority, Dogma and Positive Science in Information Systems Research," *Communications of the Association for Information Systems* (13) 2004, pp 136 - 157.
- Wilson, M., and Howcraft, D. "Re-Conceptualising Failure: social Shaping Meets IS Research," *European Journal of Information Systems* (11:4) 2002, pp 236 - 250.